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08/925,985 09/09/97 PATRICK

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EXAMINER

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Paper No. 22

Application Number: 08/925,985
Filing Date: September 09, 1997
Appellant(s): PATRICK ET AL.

Michael Lee
For Appellant

MAILED
OCT 17 2001
GROUP 1700

EXAMINER'S ANSWER

This is in response to appellant's brief on appeal filed 7/24/01.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

The brief does not contain a statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief. Therefore, it is presumed that there are none. The Board, however, may exercise its discretion to require an explicit statement as to the existence of any related appeals and interferences.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

No amendment after final has been filed.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct.

(6) *Issues*

The appellant's statement of the issues in the brief is correct.

Upon reconsideration the Examiner withdrawn the rejection of claims 1, 2, 7, and 33 made under 35 USC 102 over Hills et al; the rejection of claim 33 under 35 USC 103 over Hills et al; the rejection of claims 26-28 made under 35 USC 112(2); and the rejection of claims 4-6, 8-10, 26-30 and 32 made under 35 USC 103 over Hills et al in view of Abraham and Abraham et al. Thereby Issues E, F, H and I would not be discussed.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 1, 2, 7, 8 and 10; claims 4, 5, and 6; claim 9; claims 25, 29, 31, 32 and 33; claims 26-28; and claim 30 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,685,914	HILLS ET AL	11-1997
5,891,348	YE ET AL	4-1999
5,952,244	ABRAHAM ET AL	9-1999
5,772,906	ABRAHAM	6-1998
5,558,717	ZHAO ET AL	9-1996
6,077,357	ROSSMAN ET AL	6-2000
6,090,167	BHAN ET AL	7-2000
6,095,084	SHAMOUILIAN ET AL	8-2000
6,125,859	KAO ET AL	10-2000

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 1746

2. Claims 1, 2, 4-10, and 25-33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims are indefinite because the terms "pure metallic material" and "substantially pure metallic material" are relative terms lacking proper comparative basis.

Claim Rejections - 35 USC § 102

3. Claims 1, 2, 4-10, 25, 29-31 and 33 rejected under 35 U.S.C. 102(e) as being anticipated by Ye et al (US Patent NO 5,891,348).

Ye et al teach a method as claimed. See the entire reference, especially Figs. 2, 3a, and 3b and the related description.

The method utilizes a substrate holder (109, 112) made from aluminum (column 6, lines 33-40) and having all claimed limitations. The reference recites the claimed etching process and the claimed etching gases (column 6, lines 53-55).

Claim Rejections - 35 USC § 103

4. Claim 32 rejected under 35 U.S.C. 103(a) as being unpatentable over Ye et al (US Patent No 5,891,348).

Ye et al teach, as it is shown above the claimed method except for helium cooling.

Because the reference is directed to a problem of uniformity of the process, not to conventional details of the plasma apparatus, it is not clear from the description whether or not the helium cooling is used.

However, it is the examiner's position that helium cooling is conventionally utilized in the plasma methods. Thereby it would have been obvious to an ordinary artisan at the time the invention was made to use helium cooling in the method of Ye et al for it's primary purpose with reasonable expectation of adequate results.

5. Claims 1, 2, 7, 25, 31 and 33 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hills et al (US Patent NO 5,685,914) in view of any one of Shamouilian et al, Kao et al, Zhao et al, Bhan et al, Rossman et al and Ye et al.

Hills et al teach (entire reference) improving the etch uniformity of a plasma process by the use of a ring (124). See at least Fig. 3 and the related description. The ring has a surface, which is even and parallel with the surface of the substrate (110). The ring surrounds the substrate. The ring is made of the aluminum (column 5, lines 60-66), which is an anodized aluminum.

The plasma cloud is inside and outside of a ring 114 (see for example Fig.1) and thereby extends beyond an outer periphery of the ring 124.

Hills et al teach the use of the ring made of an anodized aluminum.

However, it was well-known and conventional in the art to make the parts of the plasma apparatuses from either aluminum or anodized aluminum. See Shamouilian et al (column 7, lines 9-13), Kao et al (column 8, lines 57-60), Zhao et al, Bhan et al (column 4, lines 47-50), Rossman et al (column 14, lines 62-66) and Ye et al (column 6, lines 33-40) as an evidence. All these references recite aluminum and anodized aluminum as alternative materials for the internal parts of the plasma apparatuses.

It would have been obvious to an ordinary artisan at the time the invention was made to substitute one conventionally used material for another one conventionally used for the same purpose with reasonable expectation of adequate results.

Thereby it would have been obvious to an ordinary artisan at the time the invention was made to use aluminum ring in the method of Hill et al with reasonable expectation of adequate results in order to increase a selection of available materials and reduce the cost of the ring because the prior art teaches aluminum and anodized aluminum as alternative and equivalent materials for the internal parts of the plasma apparatuses.

Hills et al do not specifically teach that the ring 124 contacts the substrate. It is not clear if any space is presented between the ring and the substrate.

Hills et al, however, teach that the ring 114, can cause of the trapping of contamination near the substrate periphery (column 1, lines 65-67).

Accordingly, it would have been obvious to an ordinary artisan at the time the invention was made to make the ring 124 which has the inner periphery complimentary to the outer periphery of the substrate in order to eliminate any space where the contamination can be trapped.

6. Claims 4-6, 8-10 26-30 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hills et al (US Patent NO 5,685,914) in view of any one of Shamouilian et al, Kao et al, Zhao et al, Bhan et al, Rossman et al and Ye et al as applied above further in view of Abraham(US Patent NO 5,772,906) and Abraham et al (US Patent NO 5,952,244).

Hills et al do not recite the specifically claimed type of the plasma apparatus.

However, they do not limit their method to the use of any specific type of the apparatus or any type of the plasma process.

Abraham and Abraham et al teach that the claimed chambers (TCP TM of Lam Research Corporation) and processes (aluminum etching using chlorine) were conventional in the art.

It would have been obvious to an ordinary artisan at the time the invention was made to expend the modified teaching of Hills et al to any conventional plasma etching process (including the aluminum etching processes recited by Abraham and Abraham et al) with reasonable expectation of adequate results in order to improve the uniformity of the etching.

(11) Response to Argument

35 USC 112 (2) rejections:

Group I (claims 1, 2, 7, 8, 10)

The Appellants argue that the term "pure metallic material" is not indefinite.

The Appellants rely on their own statement that "one of ordinary skill in the art would understand the scope of what is claimed, when the term "pure metallic material" is used.

The Appellants provide no support for this statement.

Art Unit: 1746

The Examiner's position is that the term is relative because it lacks comparative basis. One of ordinary skill in the art would not be able to measure the inclusions or to appreciate the distinction which may exist in the word of the claim.

Group II (claims 4, 5, 6)

The Appellants argue that the recitation that the pure metallic material comprises pure aluminum is not indefinite.

The Examiner disagrees. The claims of these group require the material comprising pure aluminum. It means that any alloy or composite material comprising a small amount of "pure aluminum" would meet the claimed limitations. Thereby the additional requirement to comprise a pure aluminum does not remedy the problem indicated for claims of Group I. Moreover, the term "pure aluminum" itself has the problem indicated for the claims of Group I.

Group III (claim 9)

The Appellants argue that the recitation that the pure metallic material comprises 99.999% pure aluminum is not indefinite.

The Examiner disagrees. The claims of these group require the material comprising 99.999% pure aluminum. It means that any alloy or composite material comprising a small amount of "pure aluminum" would meet the claimed limitations. For example, an alloy comprising only 1% of aluminum, which is 99.999% pure aluminum meets the claimed limitation. Thereby the additional requirement to comprise 99.999% pure aluminum does not remedy the problem indicated for claims of Group I.

Group IV (claims 25, 29, and 31-33)

Art Unit: 1746

The Appellants argue that the term “pure metallic planar upper surface” is not indefinite.

The Appellants’ argument is based on the statement that “substantially pure metallic material” is used as require by on Andrew Corp. v. Gabriel Electronics, 847 F.2nd 819, 6USPQ2d 2010 (Fed. Cir. 1988).

The Examiner would like to note that the cited authority is not directed to analysis of “substantially pure”. The case is directed to analysis of the term “substantially equal”. Thereby, the cited authority does not support the Appellants’ argument.

The Examiner’s position is that the term is relative because it lacks comparative basis. One of ordinary skill in the art would not be able to measure the inclusions or to appreciate the distinction which may exist in the word of the claim. The Examiner to support his position would like to cite United Carbon Co. v. Binney & Smith Co., 317 US 228, 55 USPQ 384-385 (1942), which is directed to analysis of the term “substantially pure”.

Group VI (claim 30)

The Appellants argue that the recitation that the pure metallic material comprises 99.999% pure aluminum is not indefinite.

The Examiner disagrees. The claims of these group require the material comprising 99.999% pure aluminum. It means that any alloy or composite material comprising a small amount of “pure aluminum” would meet the claimed limitations. For example, an alloy comprising only 1% of aluminum, which is 99.999% pure aluminum

Art Unit: 1746

meets the claimed limitation. Thereby the additional requirement to comprise 99.999% pure aluminum does not remedy the problem indicated for claims of Group IV.

35 USC 102 rejection over Ye et al:

Group I (claims 1, 2, 7, 8 and 10)

The Applicants argue that in Ye et al the ring (109, 112) would not be etched because only non reactive gases would flow in the channel (100, 110). The Appellants rely on a part of Ye et al (column 4, line 63 – column 5, line 2) to support their argument.

The Examiner disagrees. The cited part of the reference does not support the Appellants argument.

The cited part of the reference teaches that the channel should be of the sufficient size to allow a sufficient volume of non-reactive or exhausted process gas to enter into the channel to maintain a substantially uniform concentration of reactive process gas across the surface of the substrate.

The reference neither state that only non-reactive gasses enter the channel, nor teach extraction or separation of non-reactive gasses from reactive gasses. It is clear that gasses entering the channel and contacting the ring (109, 112) would contain at least some amount of the reactive gasses.

Moreover, the reference teach that the etching rate is substantially equalizes across the substrate by the disclosed method. See Examples.

The reference discloses the ring contacting the substrate, which is parallel with the substrate. The reference discloses aluminum as a material of the ring. The

Art Unit: 1746

reference discloses etching of an aluminum layer by the same gasses as disclosed by the Appellants. It means that the ring would be inherently etched at least at some extend during the etching of the aluminum layer of the substrate.

Group II (claims 4, 5, and 6)

The Appellants argue that the reference does not explicitly teach that the upper surface of the ring is pure aluminum.

This argument is not persuasive because the claim requires the material to comprise pure aluminum.

The reference teaches the ring made from aluminum. Thereby the claimed limitation is met because any aluminum comprise pure aluminum.

Moreover, the term "pure" is indefinite and could not serve to differentiate the claimed aluminum from aluminum of the prior art.

Group III (claim 9)

The Appellants argue that the reference does not explicitly teach that the upper surface of the ring is 99.999% pure aluminum.

This argument is not persuasive because the claim requires the material to comprise 99.999% pure aluminum.

The reference teaches the ring made from aluminum. Thereby the claimed limitation is met because the concentration of aluminum is not claimed. Any aluminum can be described as comprising 99.999% pure aluminum.

Group IV (claims 25, 29, and 31-33)

Art Unit: 1746

To rebut the rejection of these claims the Appellants provided the arguments similar to the arguments presented for Group I.

The analysis of the arguments presented for Group I is believed to be fully applicable to the arguments directed to Group IV.

Group V (claims 26-28)

The Appellants argue that the reference does not teach the ring made essentially of aluminum.

The argument is not persuasive because it contradict to the teaching of the reference, which teaches aluminum (column 6, lines 33-40).

It is noted that the Appellants admitted that the reference teaches aluminum as a preferred material, but argue that the reference does not teach the ring being essentially aluminum.

It appears that the Appellants are confused. How can the aluminum be not essentially aluminum?

Group VI (claim 30)

To rebut the rejection of these claims the Appellants provided the arguments similar to the arguments presented for Group III.

The analysis of the arguments presented for Group III is believed to be fully applicable to the arguments directed to Group VI.

Art Unit: 1746

35 USC 103 rejection of claim 32 under Ye et al:

The Appellants rely on the arguments directed to claim 31. The Appellants do neither argue any additional limitations of claim 32, nor rebut the Examiner's reasoning of obviousness motivation. The arguments directed to claim 31 were addressed above. The Examiner's position is that the claim is properly rejected.

35 USC 103 rejection of Claims 1, 2, 7, 25, 31 and 33 under Hills et al in view of Shamouilian et al, Kao et al, Zhao et al, Bhan et al, Rossman et al and Ye et al:

Group I (claims 1, 2, and 7)

The Appellants argue that the rejection is not proper because the cited references do not teach that "providing a sacrificial etch surface parallel to the substrate would successfully provide a more uniform etch.

This argument is not persuasive because the ring 124 in contrast to the Appellants arguments serves to improve etch uniformity.

Moreover, at least one of the secondary references (Ye et al) also teaches the same.

The Examiner's position is that the ring of Hills et al would be etched at least to the some extend by the plasma.

It is believed that the Examiner's position does not even contradict to the Declaration of Mr. Patrick under 37 CFR 1.132 filed 3/2/01.

Art Unit: 1746

The Declaration merely states that the anodized aluminum is difficult to etch compare with pure aluminum. This statement does not contradict with the examiner's position that the anodized aluminum is capable to be etched.

It is noted that the Declaration does not make a clear statement that anodized aluminum is not "capable of being etched" by plasma.

Thereby, even Hills et al alone teach improving etching uniformity with a sacrificial ring.

The Appellants also argue that the applied references do not suggest the claimed combination. The Appellants further argue that the Examiner failed to provide the reasoning to combine the references.

The Examiner disagrees. First, the references clearly teach aluminum and anodized aluminum as preferred and equivalent materials for processing chambers in the semiconductor processing art. Second, the reasoning was provided in the rejection. The Appellants did not comment why the provided reasoning is not proper.

Group IV (claims 25, and 31-33)

The Appellants provided the arguments similar to the arguments discussed above with respect to Group I.

These arguments were addressed.

In addition the Appellants argue that the cited references do not teach the sacrificial holder with the surface which is even with the surface of the substrate.

Art Unit: 1746

This argument is not persuasive because Hills et al teach this. See Fig. 3 , on which it is clearly shown that the surface of substrate 110 is even with the surface of. ring 124.

35 USC 103 rejection of Claims 1, 2, 7, 25, 31 and 33 under Hills et al in view of Shamouilian et al, Kao et al, Zhao et al, Bhan et al, Rossman et al and Ye et al further in view of Abraham and Abraham:

Group I (claims 8 and 10)

The Appellants argue that the rejection is not proper because, according to Appellants, the applied references do not teach forming of volatile products.

The argument is not persuasive because etching aluminum with chlorine referenced by Abraham and Abraham is the same process as the process of the invention. Moreover, the sacrificial ring in the modified method of Hills et al is also aluminum. Therefore, the products of the modified method of Hills et al would be obviously the same as in the method of the invention.

Group II (claims 4-6)

The Appellants argue that the rejection is not proper because none of the applied references teaches a sacrificial ring made of the pure aluminum. The Appellants also rely on the declaration that state that the anodized aluminum is difficult to etch.

The arguments are not persuasive:

Art Unit: 1746

First, the rejection made over the combination of the references, and it was shown that it would have been obvious to an ordinary artisan at the time the invention was made to substitute the ring of Hills et al with the ring made of aluminum.

Second, the ring of Hills et al, is sacrificial because anodized aluminum would be etched at least to the some extend by the plasma. Even the declaration on which the Appellants rely states that the anodized aluminum is hard to etch, but does not state that it would not be etched. Even if the etching rate of anodized aluminum is slower than the etching rate of aluminum, the ring would be etched.

Third, the claims are not limited to pure aluminum. It recites the material comprising pure aluminum.

Fourth, in the modified method of Hills et al the ring would be aluminum and would be etched.

Group III (claim 9)

The Appellants argue that the applied references do not teach that the upper surface of the ring is 99.999% pure aluminum.

This argument is not persuasive because the claim requires the material to comprise 99.999% pure aluminum.

Any aluminum can be described as comprising 99.999% pure aluminum.

In the modified method of Hills et al the ring would be aluminum and would be etched.

Group IV (claims 29 and 32)

Art Unit: 1746

The Appellants rely on the limitations of claims 25, and 31 and do not present additional arguments. The arguments directed to claims 25 and 31 were addressed above.

Group V (claims 26-28)

As to claim 26, the Appellants argue that the references as applied do not teach the ring which is essentially aluminum. This is not persuasive because it was clearly shown in the rejection that the ring in the modified method of Hills et al would be aluminum.

As to claim 27, the Appellants argue that the claim requires the etching gas to include chlorine and thereby, according to the Appellants, the claim would not have been obvious. The Appellants do not provide any reasoning to support their statement. The Examiner disagrees with the Appellants statement because of the reasons presented in the rejection. It is noted that the rejection shows that it would have been obvious to an ordinary artisan at the time the invention was made to expend the modified teaching of Hills et al to any conventional plasma etching process (including the aluminum etching processes recited by Abraham and Abraham et al) with reasonable expectation of adequate results in order to improve the uniformity of the etching.

As to claim 28, the Appellants do not provide any additional arguments. The Appellants rely on the limitations of claim 27 which are addressed above.

Group VI (claim 30)

The Appellants argue that the applied references do not teach that the upper surface of the ring is 99.999% pure aluminum.

Art Unit: 1746


This argument is not persuasive because the claim requires the material to comprise 99.999% pure aluminum.

Any aluminum can be described as comprising 99.999% pure aluminum.

In the modified method of Hills et al the ring would be aluminum and would be etched.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,


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October 9, 2001

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